Optics in Debuncher

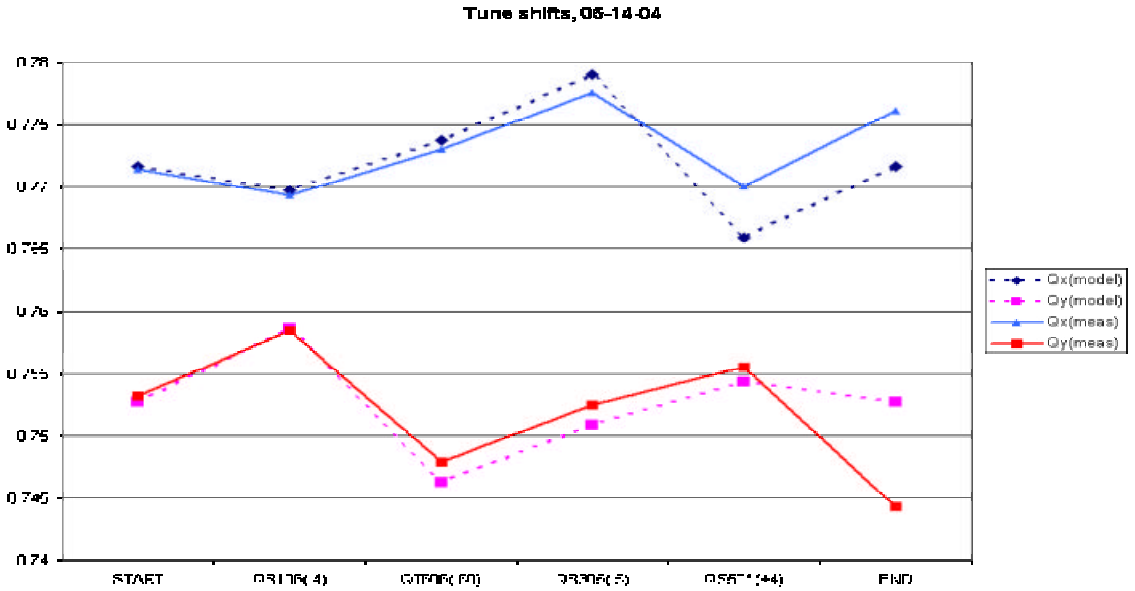
Optics in Debuncher

- Why do we need to know the Debuncher lattice better?
- How well do we know the lattice in Debuncher?
- Can we improve the accuracy of the lattice model?
- New procedure of lattice measurements
- Plans

Why do we need to know the Debuncher lattice better?

- Reaching higher intensities in Debuncher become a main battlefield in the Antiproton source, and this needs confidence in our knowledge of the ring lattice.
- Maintaining the designed lattice in the machine is necessary in order to keep healthy dynamic aperture.
- Possible scenarios of cooling optimization include manipulations with the lattice.

How well do we know the lattice in Debuncher?



Tune shifts: very brief look

1. Stay in safe range
2. Return back
3. Step up with current

Can we improve the accuracy of the lattice model?

Tools for lattice measurements:

orbit excitation -> comparing to model calculations

- Global fitting
  - fits all quads for you
  - no tool to analyze systematics
  - expert interface
- Manual optimization
  - excellent visual interface
  - can see bad BPMs
  - expert mode
  - tune large number of params
- LOCO

LOCO- a new tool for model optimization

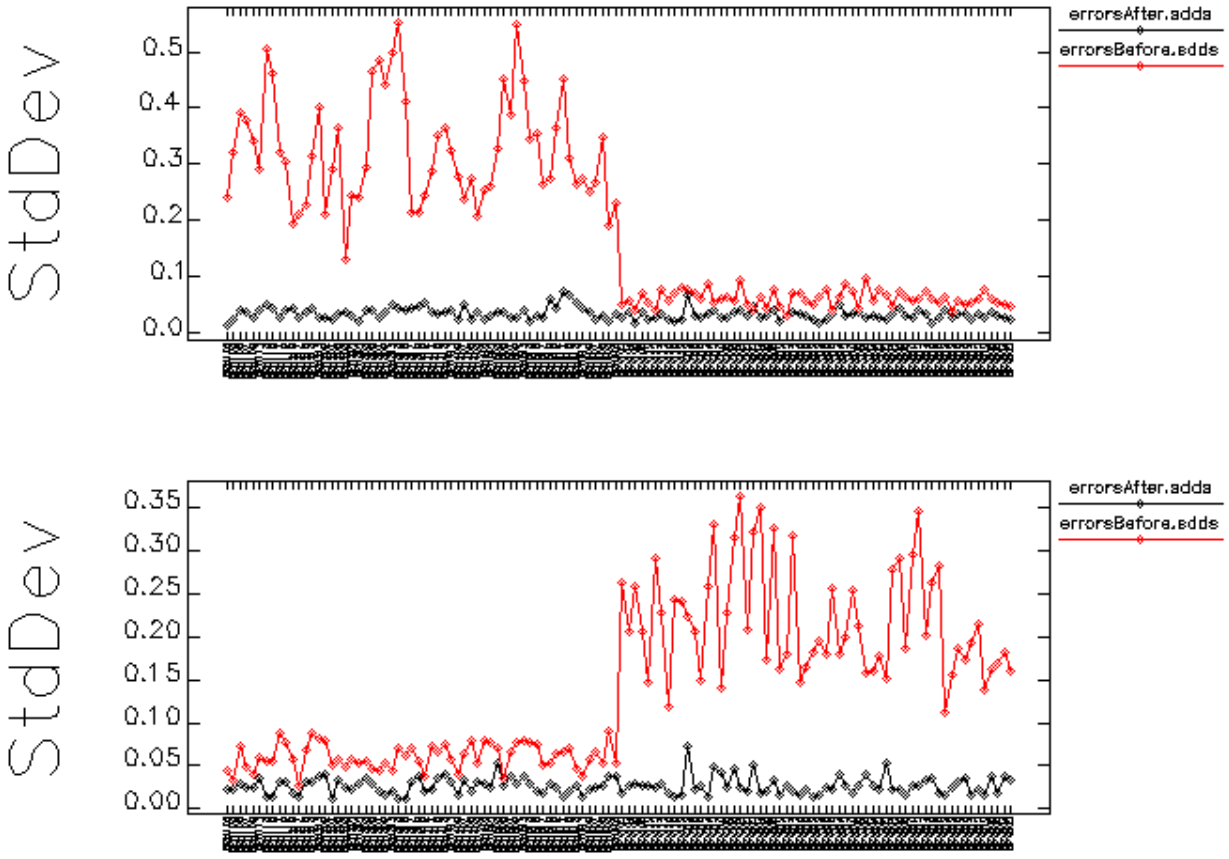
Calculates orbit response to each variable
Solves inverse problem- to find corrections to each variable.

Large number of orbits

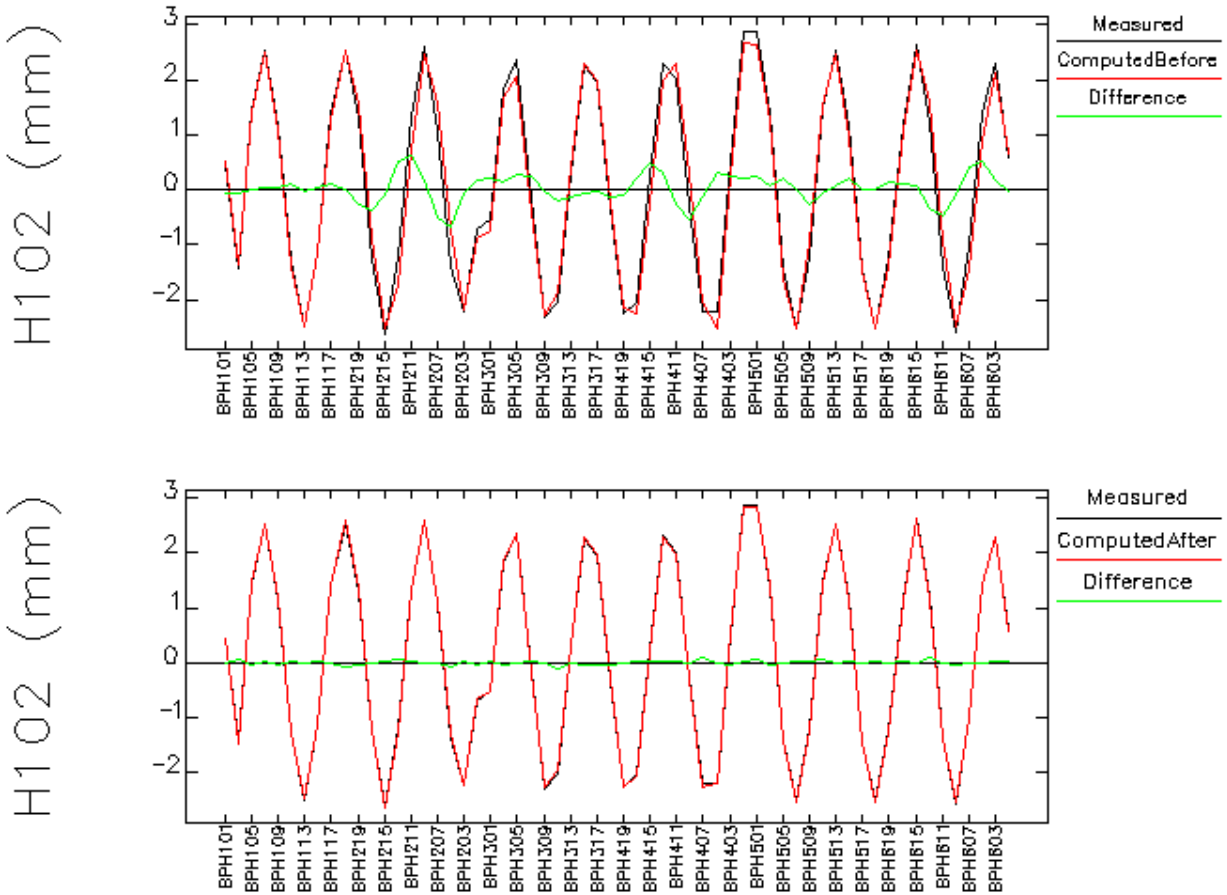
All variables- gains, gradients, correctors, tilts.

Fast calculations

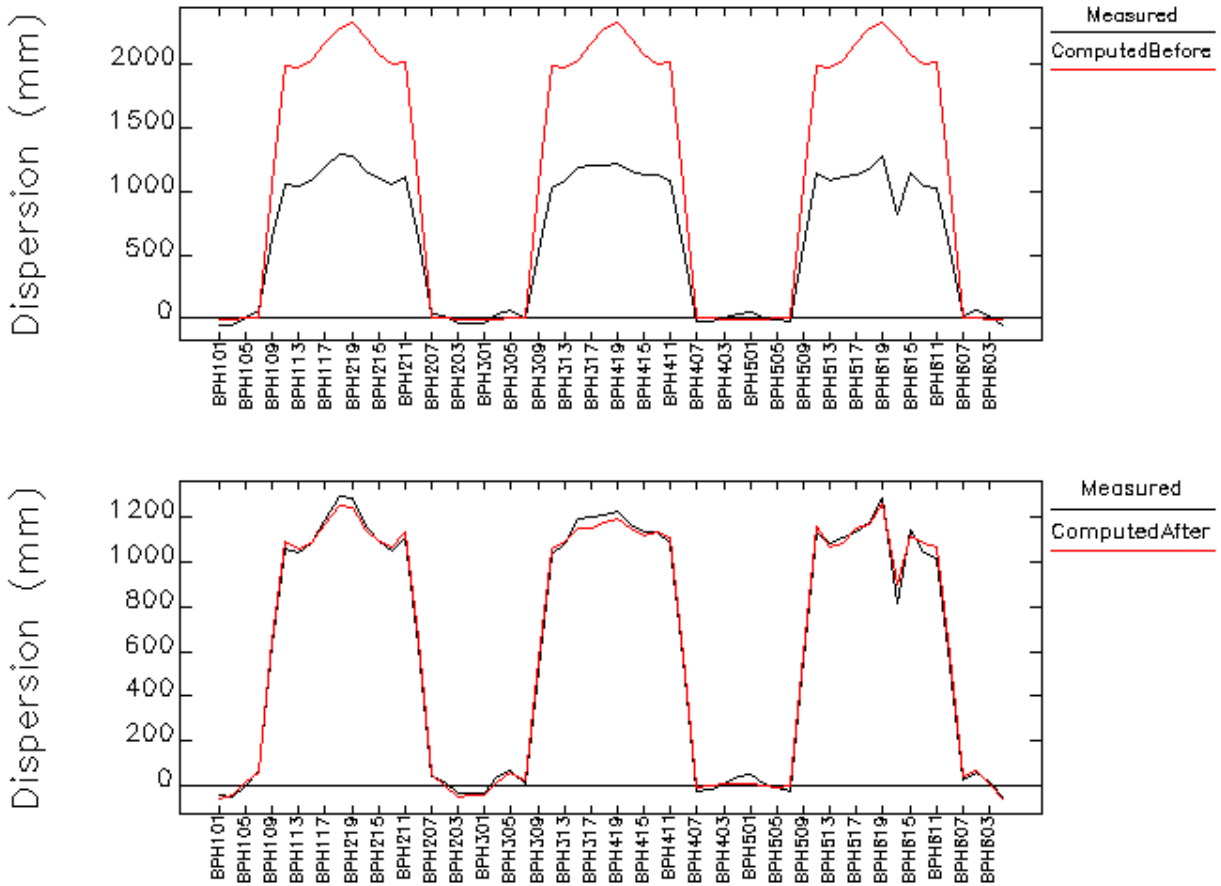
LOCO - Total BPM rms



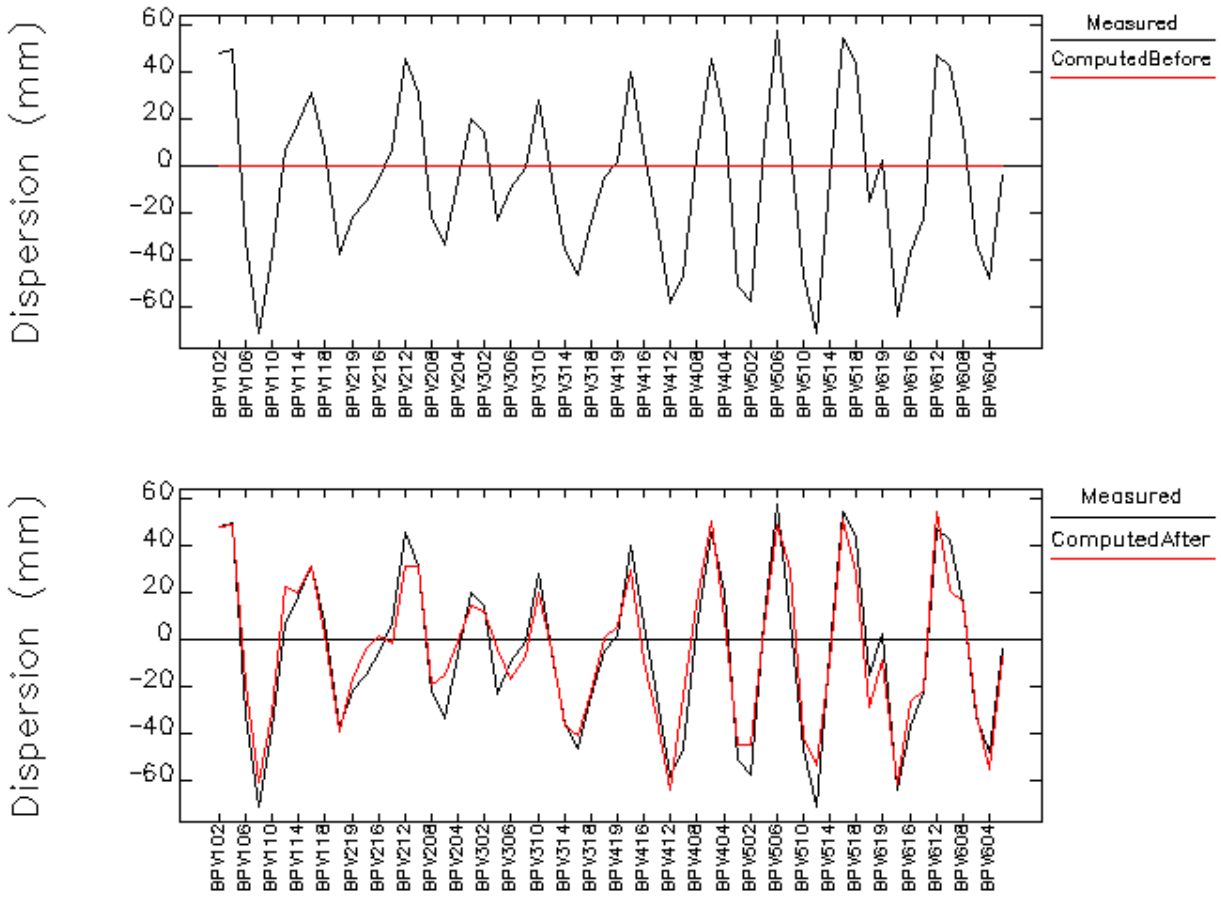
LOCO - Horizontal orbit fit



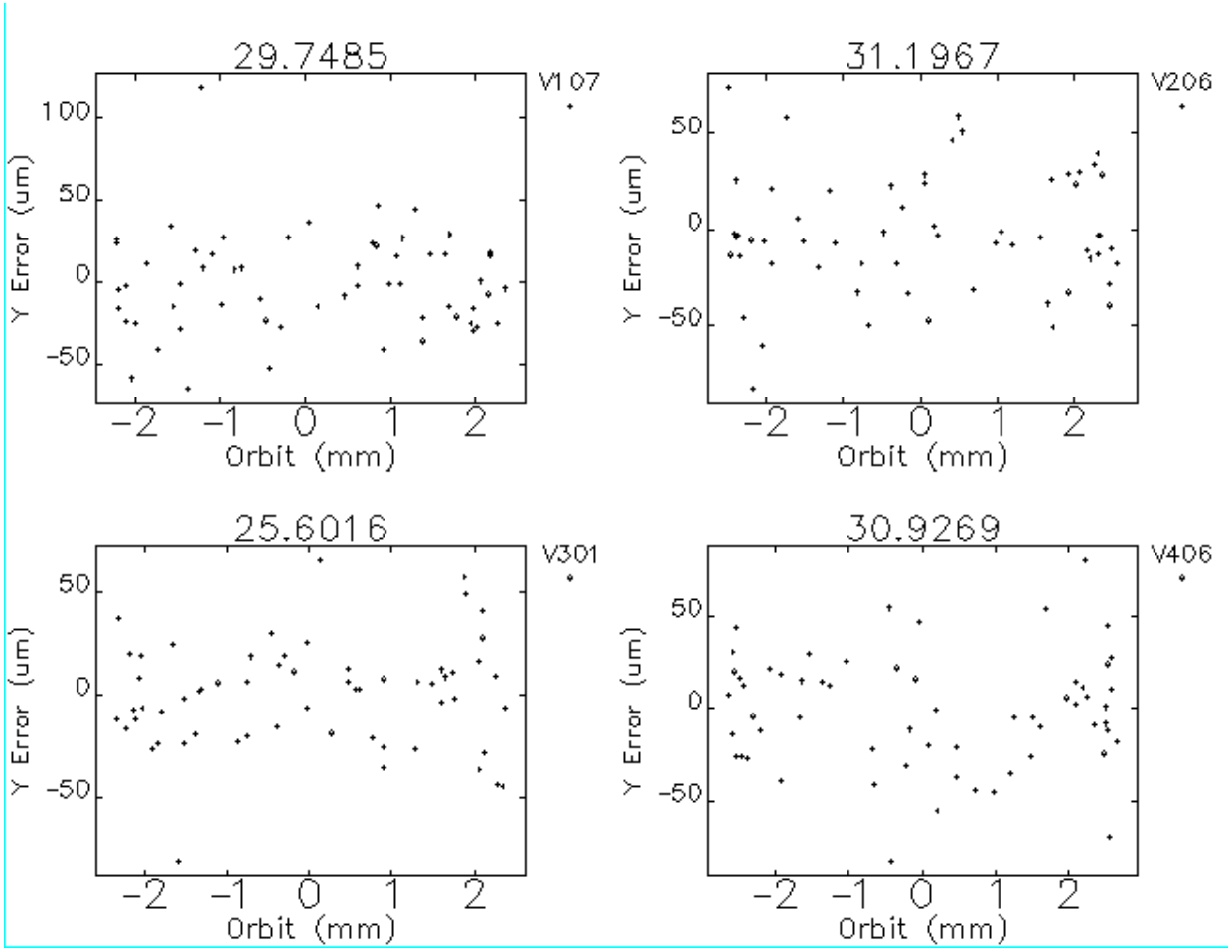
LOCO – Horizontal dispersion



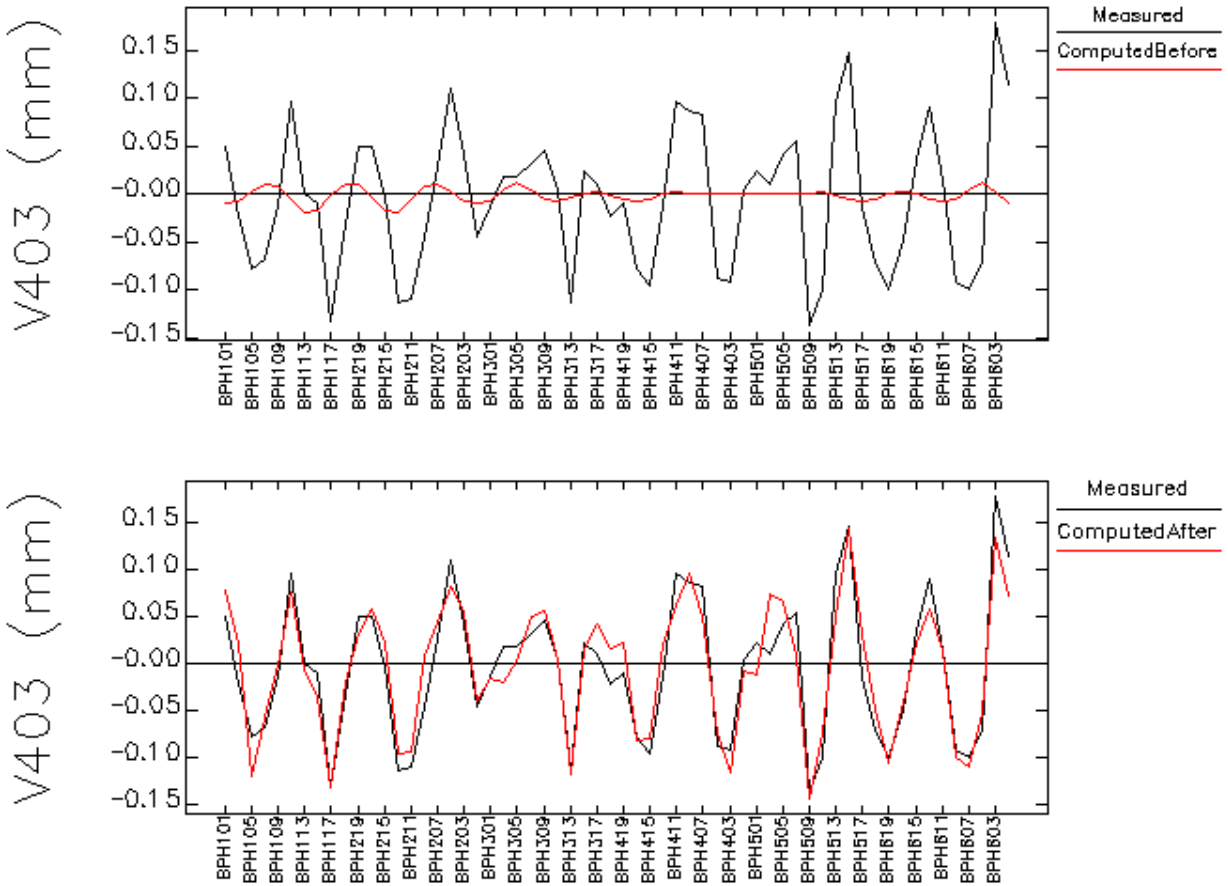
LOCO – Vertical dispersion



LOCO - Error correlations



LOCO - Y->X


V403 (mm)
0.15
0.10
0.05
-0.00
-0.05
-0.10
-0.15
BPH101
BPH105
BPH109
BPH113
BPH117
BPH219
BPH215
BPH211
BPH207
BPH203
BPH301
BPH305
BPH309
BPH313
BPH317
BPH419
BPH415
BPH411
BPH407
BPH403
BPH501
BPH505
BPH509
BPH513
BPH517
BPH619
BPH615
BPH611
BPH607
BPH603
Measured
ComputedBefore
V403 (mm)
0.15
0.10
0.05
-0.00
-0.05
-0.10
-0.15
BPH101
BPH105
BPH109
BPH113
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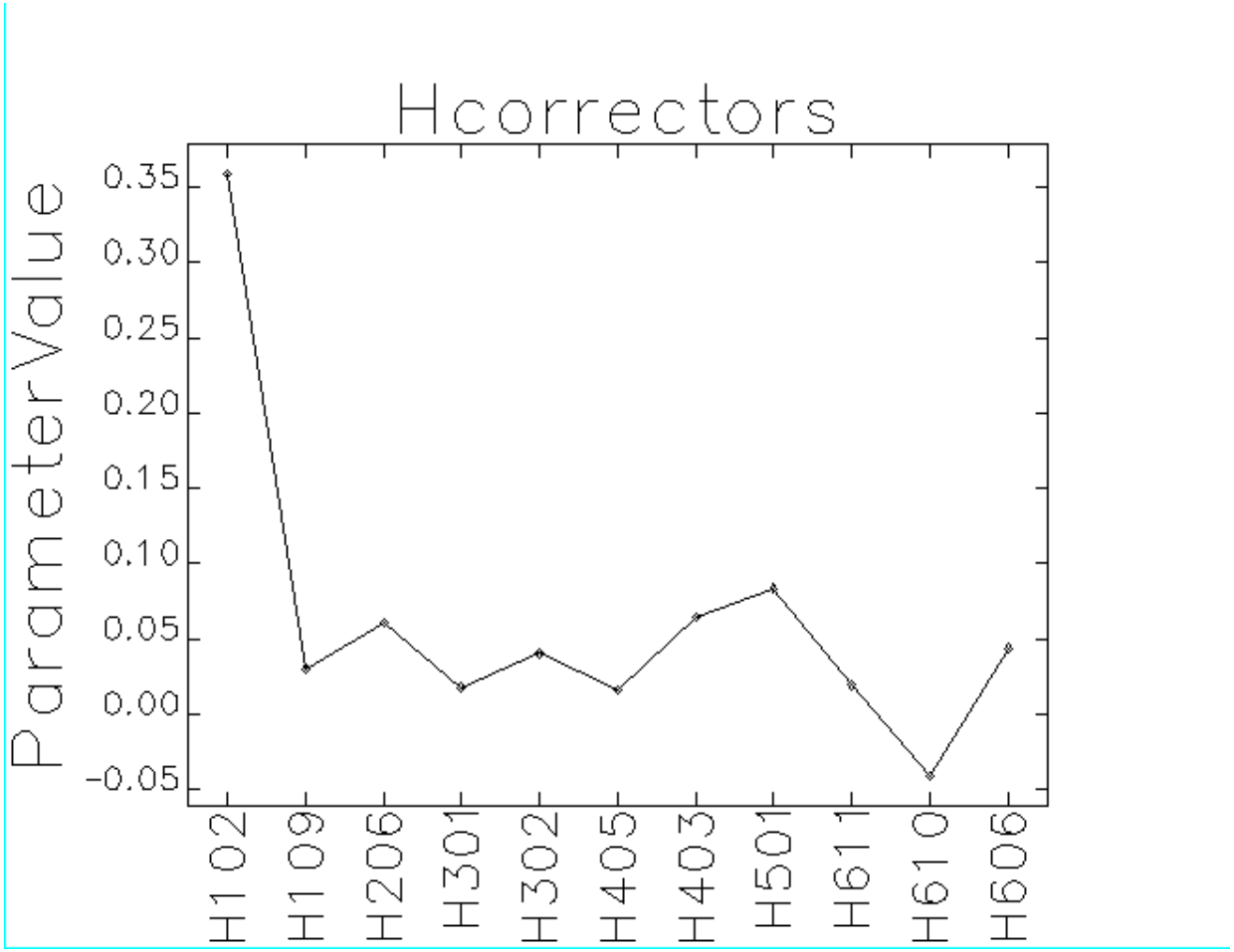
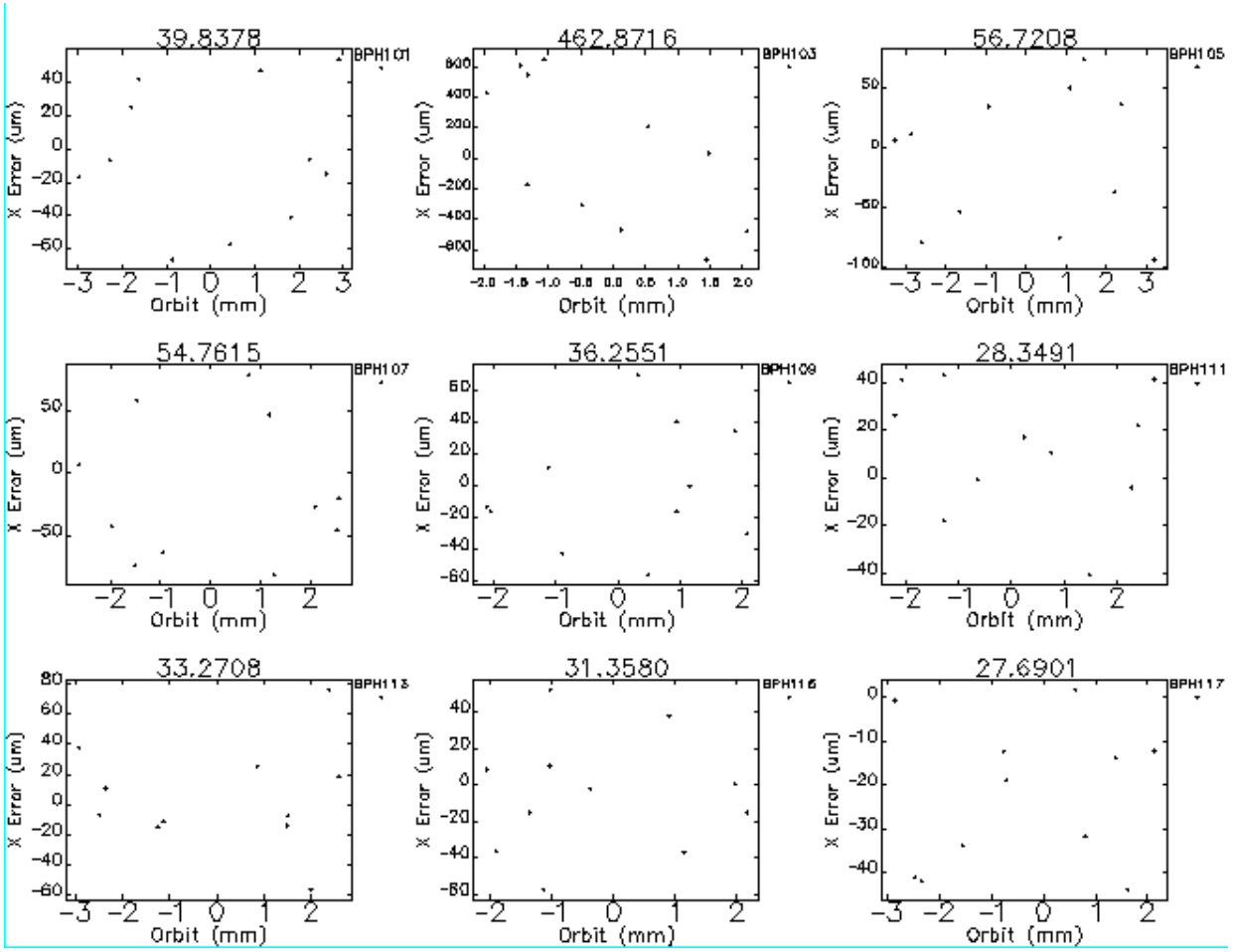
BPH603
Measured
ComputedAfter

LOCO - H102 move



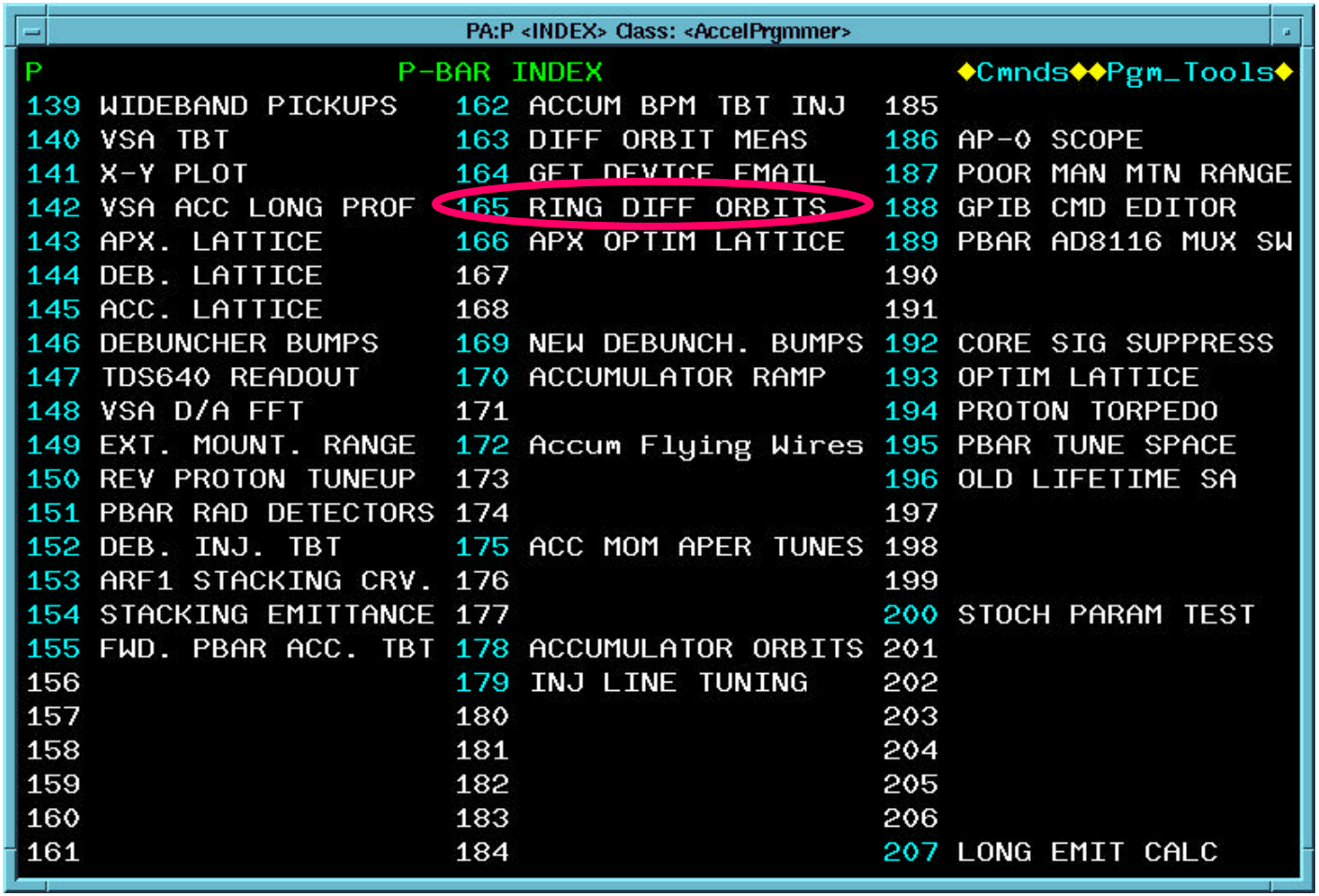
LOCO - H102 move



Implementation, procedure and plans

- Taking data program (application P165)
- Deployment of LOCO for Debuncher
- Study time to take quality data
- Shutdown modifications
- Analyzing data
- Model verification (tune shifts- procedure, study time)

Orbit measurements



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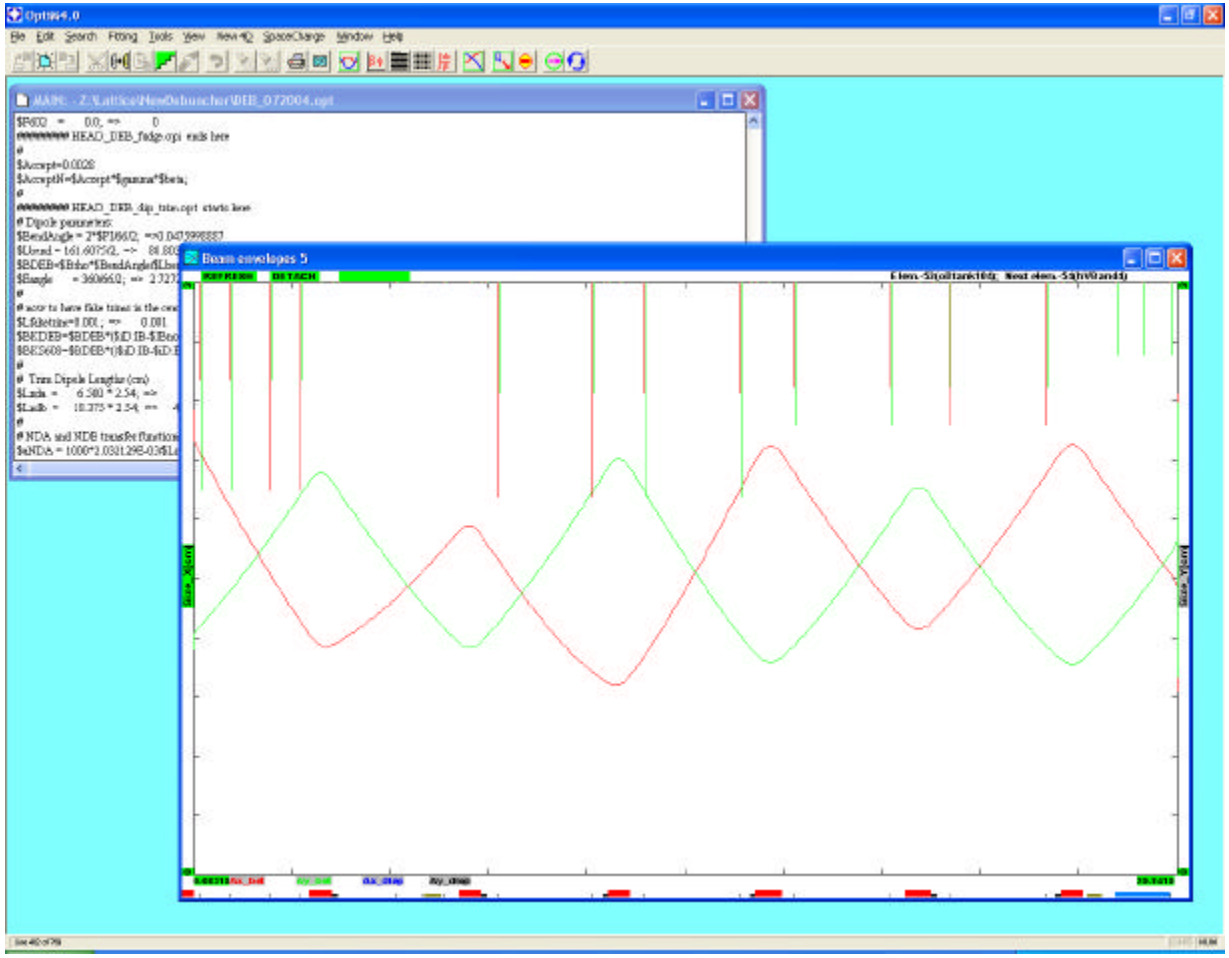
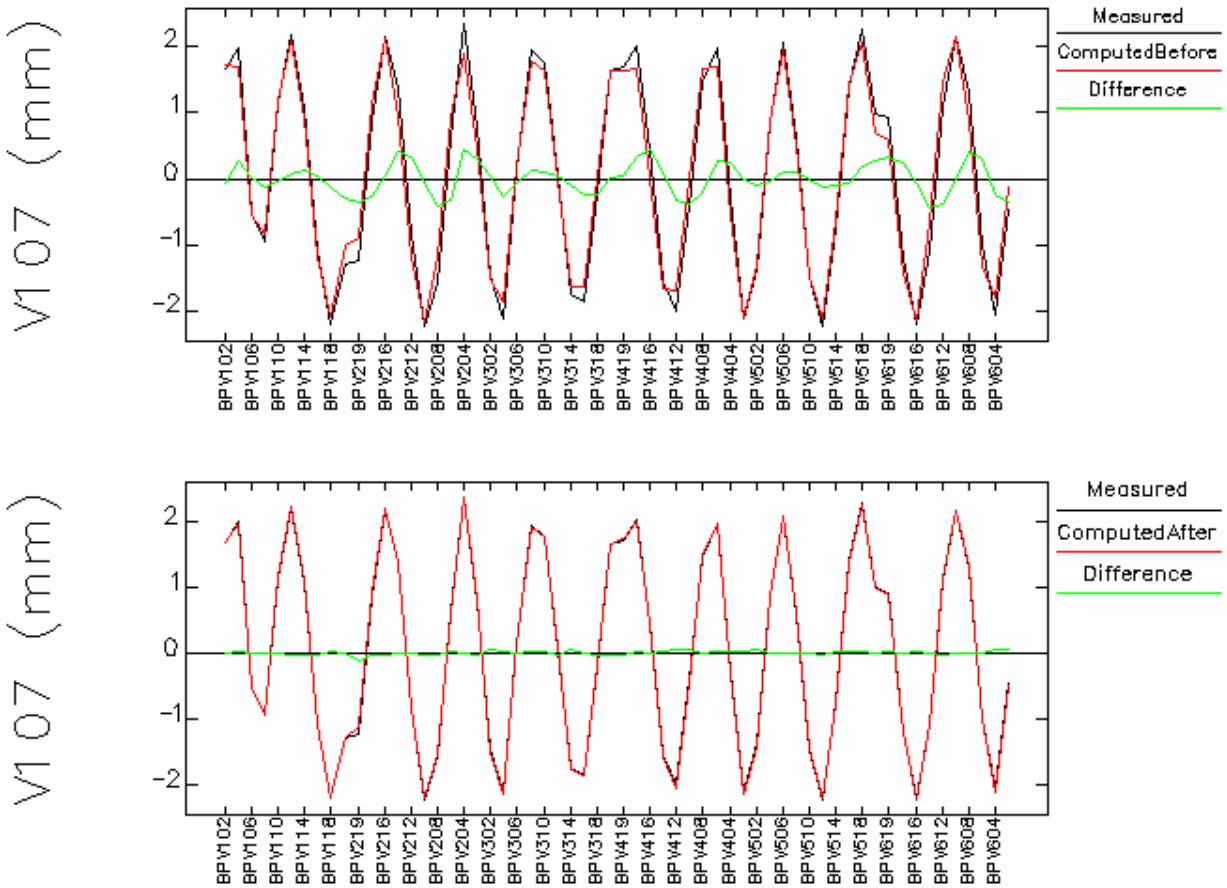
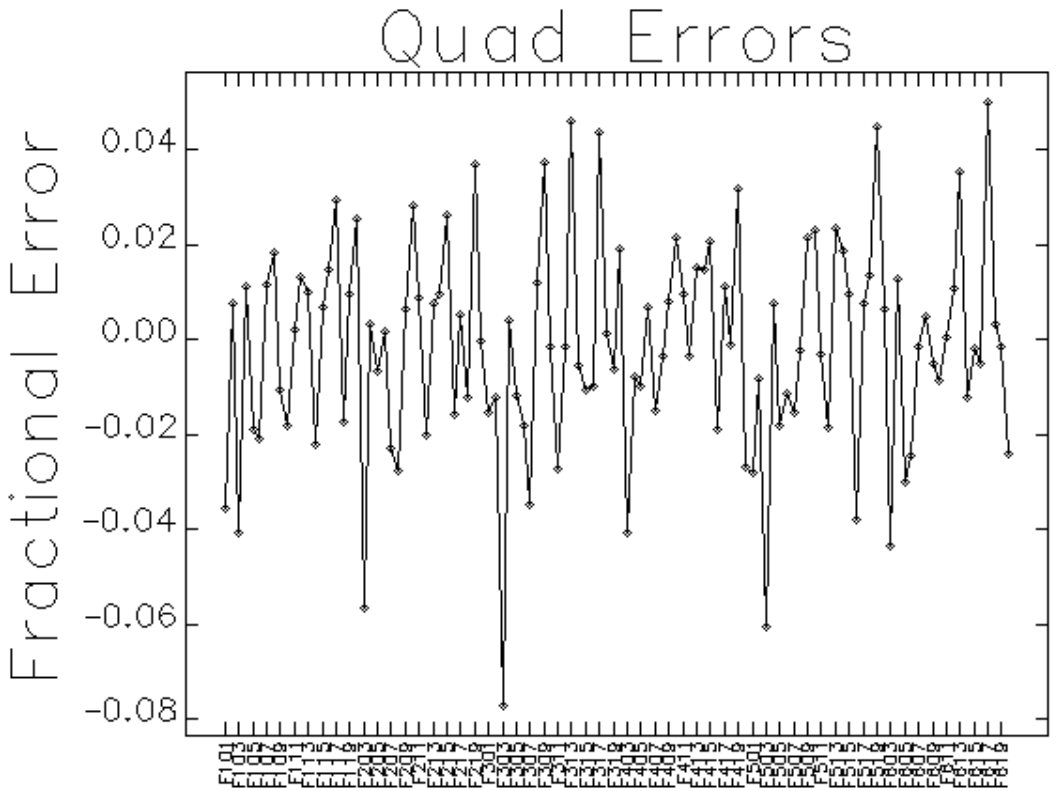

Opt8v4.0
File Edit Search Prog Tools View New IO SpaceCharge Window Help
Beam envelopes 5
REFRESH
DETACH

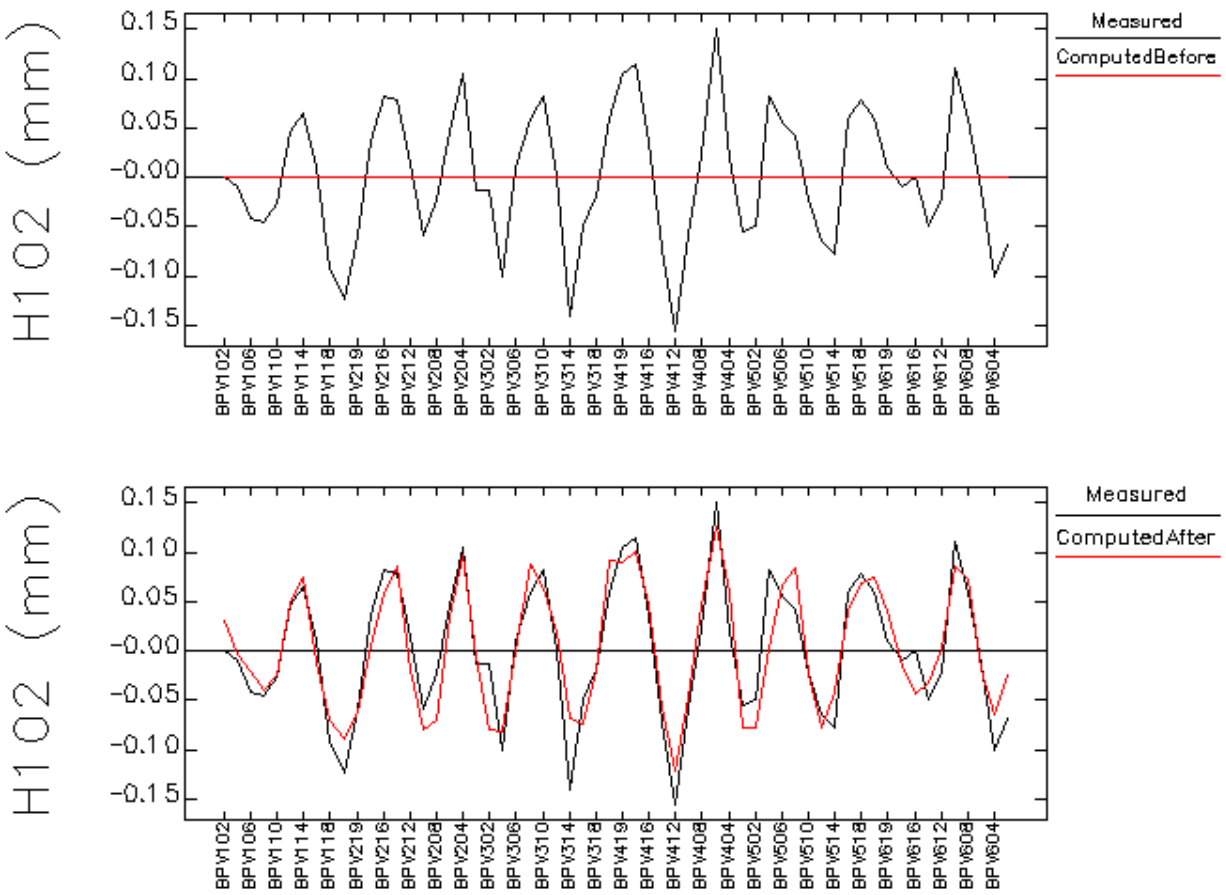
Vertical orbit fit



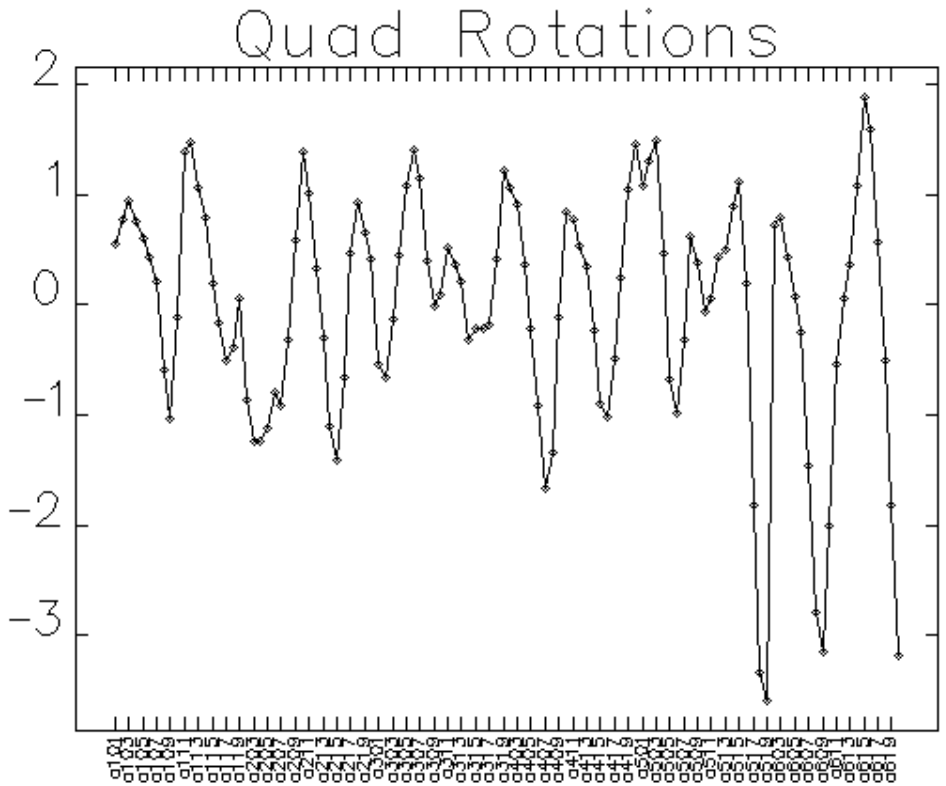
Quadrupole errors



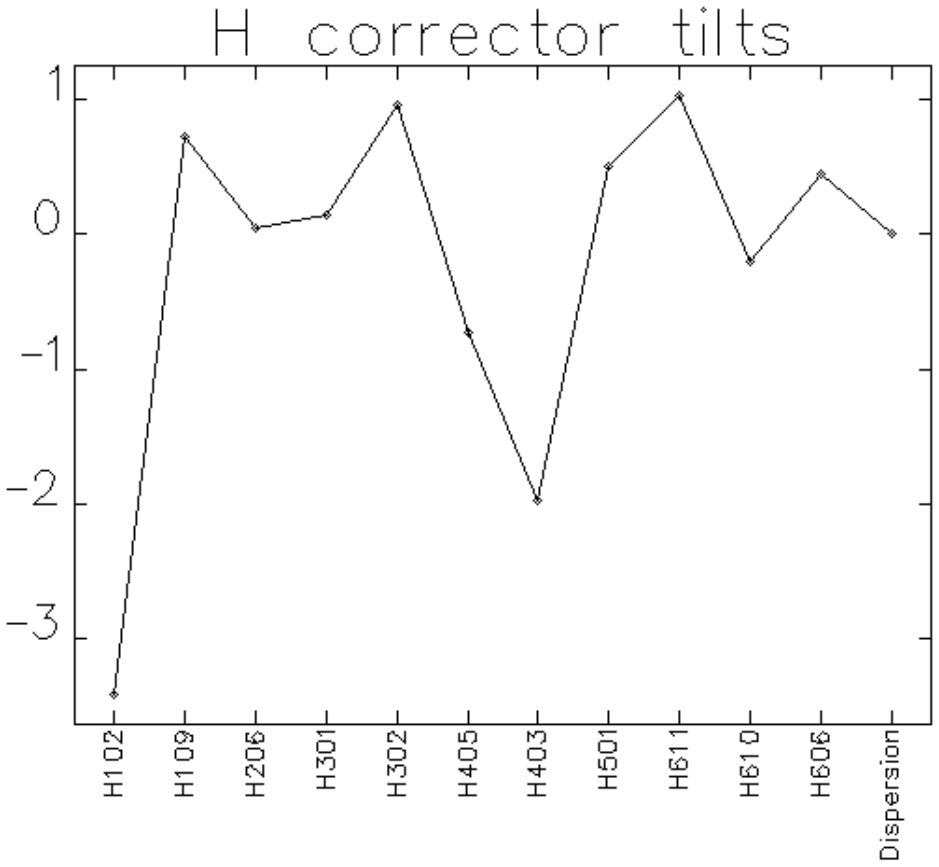
X->Y


H102 (mm)
0.15
0.10
0.05
-0.00
-0.05
-0.10
-0.15
BPW102 BPW106 BPW110 BPW114 BPW118 BPW219 BPW216 BPW212 BPW208 BPW204 BPW302 BPW306 BPW310 BPW314 BPW318 BPW419 BPW416 BPW412 BPW408 BPW404 BPW502 BPW506 BPW510 BPW514 BPW518 BPW619 BPW616 BPW612 BPW608 BPW604
Measured
ComputedBefore
H102 (mm)
0.15
0.10
0.05
-0.00
-0.05
-0.10
-0.15
BPW102 BPW106 BPW110 BPW114 BPW118 BPW219 BPW216 BPW212 BPW208 BPW204 BPW302 BPW306 BPW310 BPW314 BPW318 BPW419 BPW416 BPW412 BPW408 BPW404 BPW502 BPW506 BPW510 BPW514 BPW518 BPW619 BPW616 BPW612 BPW608 BPW604
Measured
ComputedAfter

Quad tilts



Horizontal corrector tilts



Vertical corrector tilts